

REMARKS

Applicants are amending their claims in order to further clarify the definition of various aspects of the present invention, providing claims consistent with the claims in Application No. 10/682,901, filed October 14, 2003, which claims priority under 35 USC §120 based upon a same prior application or applications as claimed in the above-identified application. Specifically, all claims in the above-identified application, which are all independent claims, have been amended to recite a vacuum processing apparatus including, inter alia, a plurality of vacuum processing chambers. These claims 1-4 have been further amended to recite that the cassette mount tables are in an atmosphere; and that the apparatus includes an atmospheric transfer device for transferring the substrates (or the substrates and the dummy substrates) in the atmosphere, this atmospheric transfer device being capable of moving at least vertically. These claims 1-4 have been still further amended to recite that the control means is (a) for transferring substrates (or for transferring substrates and dummy substrates) to be processed from any location in any one of the cassettes mounted on the cassette mount tables in the atmosphere to at least one of the vacuum processing chambers via the atmospheric transfer device, and (b) for transferring processed substrates from the vacuum processing chambers to respective original positions within original cassettes, in which the substrates were stored prior to processing, via the atmospheric transfer device. Note, for example, pages 7-10 of Applicants' specification, especially together with Figs. 1 and 2 of Applicants' original disclosure.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior

art applied by the Examiner in rejecting claims in the Office Action mailed July 28, 2004, that is, the teachings of the U.S. patents to Bramhall, et al., No. 4,923,584, and to Mase, et al., No. 5,169,407, and the article "Drafts" (that is, the article entitled "Drafts in Symposium of VLSI and FA Technology"), under the provisions of 35 USC §103.

It is respectfully submitted that the references as applied by the Examiner would have neither taught nor would have suggested such a vacuum processing apparatus as in the present claims, having the recited component structure, and in particular having the control means (a) for transferring substrates to be processed from any location in any one of the cassettes mounted on the cassette mount tables in the atmosphere to at least one of the vacuum processing chambers via the atmospheric transfer device, and (b) for transferring processed substrates from the vacuum processing chambers to respective original positions within original cassettes, in which the substrates were stored prior to processing, via the atmospheric transfer device, and having the atmospheric transfer device capable of being controlled such that substrates (or substrates and dummy substrates) can be taken out of any location in the cassettes mounted on the cassette mount tables. See each of claims 1-4.

As will be discussed further infra, the article "Drafts" has a single cassette, disclosing return of a wafer to the original position in this single cassette after the end of the processing, and would have neither disclosed nor would have suggested, either alone or in combination with the teachings of Bramhall, et al., wherein the wafer is returned to respective original positions within original cassettes (that is, more than one cassette) in which the substrates were stored prior to processing.

Moreover, it is respectfully submitted that the applied references would have neither taught nor would have suggested such a vacuum processing apparatus as in the present claims, having the recited components including, inter alia, the control means and atmospheric transfer device as discussed previously, and, moreover, wherein the control means is for transferring substrates to be processed "one by one" and for transferring processed substrates "one by one". See claim 2; note also claim 4.

Furthermore, it is respectfully submitted that these references would have neither taught nor would have suggested such a vacuum processing apparatus as in the present claims, having features as discussed previously, and, moreover, wherein the apparatus includes a plurality of cassette mount tables in an atmosphere for mounting, inter alia, at least one cassette storing at least one of dummy substrates, with the atmospheric transfer device being for transferring, inter alia, the dummy substrates and wherein this atmospheric transfer device is capable of being controlled such that, inter alia, dummy substrates can be taken out of any location in the cassettes mounted on the cassette mount tables; and with control means being for transferring, inter alia, the dummy substrates from any location in any one of the cassettes mounted on the cassette mount tables in the atmosphere and for transferring, inter alia, dummy substrates to respective original positions within original cassettes, in which the substrates and dummy substrates were stored prior to processing, by way of the atmospheric transfer device. See claims 3 and 4.

According to aspects of the present invention as claimed herein, a vacuum processing apparatus is provided having a control means for substrate transfer such that substrates (e.g., semiconductor wafers to be processed) and dummy substrates

(e.g., substrates for cleaning) stored at any location in any of the plurality of cassettes, can be supplied to the vacuum processing chambers, and after processing therein can be returned back to an original position within the original cassette. Thus, there is a great degree of freedom in transfer of substrates to be processed, increasing flexibility of the apparatus. According to the present invention, either an individual wafer or a series of wafers, starting at any position on any of the cassettes, can be transferred, providing a great choice in selection of substrates and/or dummy substrates to be transferred either for processing of the substrates or for cleaning of the vacuum processing chambers. According to other features of the present invention, the substrates can be transferred one by one, again increasing flexibility in use of the apparatus.

With an arrangement of apparatus as in the present claims, it is possible to perform management and control of processing for every substrate and dummy substrate in an easy and effective manner, increasing the control as well as flexibility of the apparatus. Accordingly, it is possible to adapt for various kinds of processing forms for the substrate. For example, it is possible to perform a cleaning processing using a dummy substrate at a vacuum processing chamber, during processing of the substrate to be processed (for example, a product wafer) at another processing chamber. Due to this fact, it becomes possible to perform production with a high degree of flexibility in using the vacuum processing apparatus having a plurality of vacuum processing chambers.

The present invention provides not only the ability to utilize a dummy substrate during the course of processing the regular substrates, it places the dummy substrates in a cassette on the cassette mount tables in the atmosphere.

Furthermore, the dummy substrates can be in a cassette with other dummy substrates. It also uses the same transfer mechanism (atmospheric transfer device) to provide the ability to transfer a substrate or a dummy substrate, thereby permitting the same processing procedures to selectively choose a particular substrate or dummy substrate.

It is respectfully submitted that placing the dummy substrates within a cassette, this cassette with dummy substrates being located on the cassette mount tables in the atmosphere which also mount at least one cassette storing substrates to be processed, with a controller for controlling the transfer mechanism to selectively choose a substrate or dummy substrate, would have neither been disclosed nor suggested by the applied prior art, as discussed infra. Furthermore, due to this structure, utilization of dummy substrates during the ongoing processing of substrates is permitted without having to stop the processing of substrates, without having to modify any mechanism, and without having to terminate the processing of the substrates forming the products. With dummy substrates in the cassette mounted on the cassette mount tables, and the control means which controls transfer of the substrates and dummy substrates, there can be continuous operation without interruption during the course of the cleaning operation.

The flexibility of the presently claimed apparatus and process is again emphasized. Not only is there the capability of selecting a substrate or dummy substrate during the course of the processing, but the substrate can be selected from any location of any cassette, and likewise the dummy substrate can be selected from any location of e.g., its cassette. Thus, there can be an arbitrary and flexible selection of any substrate (including any dummy substrate) in accordance

with the programming desired. Furthermore, the selected substrate, whether a substrate or dummy substrate, can after its use be returned to its same position within the same original cassette to which it was extracted. These features of the present invention, providing flexibility as discussed herein, would have neither been disclosed nor suggested by the teachings of the applied prior art.

Bramhall, et al. discloses a modular sputtering system which is capable of sputter coating substrates either serially or in a selective access sequence. According to the apparatus in Bramhall, et al., a central substrate handling or staging chamber is provided with separately pumped process chambers, and dual load lock chambers are provided which are alternately loaded with multiple-piece substrate batches, using an external substrate handling robot. See column 3, lines 28-34. In column 14, lines 41-58, of Bramhall, et al., there is a disclosure that for processing, the platen assembly is rotated from the broken line position of Fig. 11 to the solid line positioned wherein the platen assembly sealingly engages a wall of the staging chamber adjacent to a processing chamber such as the sputtering chamber 18, whereupon the chamber 18 can be evacuated by its dedicated pumping system in preparation for processing. Upon completion of processing, the platen assembly is returned to its horizontal position, and the clamp assembly is positioned for extraction of the wafer by the arm 80. The wafer can then be moved to another station for further processing, or if processing is completed, returned to a rack 41 below one of the load locks from which they can then be returned to cassettes on the platform 26 by means of the elevator 47 and the handling assembly 34.

As described particularly in column 6, lines 7-27 of Bramhall, et al., in connection with Figs. 1 and 2, this patent discloses a cassette-load of wafers 30

being transferred, one-at-a-time, from one of the cassettes 28, to the flat-finder 32 and then to the rack 41 by means of the wafer handling assembly. The door 39 is then closed and the chamber partially evacuated using a mechanical roughing pump. One of the valves 49 is then opened and cryogenic pump 52 is activated to evacuate the open load lock 22 to a pressure approaching that of the chamber 14. After movement of elevator 42 supporting the rack 41 downward, a rack load of wafers are in position to be accessed by the wafer handling assembly 24.

It is emphasized that this patent discloses a cassette-load of wafers being transferred to the rack 41 ultimately provided in the load lock. It is respectfully submitted that this transfer would have taught one of ordinary skill in the art a transfer from the cassette of wafers top-to-bottom of the cassette; in any event, clearly Bramhall, et al. is silent with respect to extraction from any location of any one of the cassettes, and would not have provided the flexibility achieved according to the present invention.

Furthermore, it is respectfully submitted that Bramhall, et al. would not have disclosed, nor would have suggested, the substrate or dummy substrate return as in the present claims, especially together with the extraction of substrates from any location of any one of the cassettes, and advantages thereof as discussed previously; and neither would have disclosed nor would have suggested the other aspects of the present invention as discussed previously, and advantages thereof.

It is respectfully submitted that the secondary references as applied by the Examiner would not have rectified the deficiencies of Bramhall, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Drafts discloses a single wafer processing type etching apparatus, for etching aluminum and aluminum alloy films on large diameter wafers. The described apparatus includes a reactive ion etching apparatus provided with a SECS interface function of SEMI for connection with a HOST computer in order to realize introduction of FA of the semiconductor device manufacturing apparatus. Drafts describes that the wafers are always held in perpendicular positions during handling and etching, in order to minimize adhesion of dust to the wafers. This document goes on to disclose an etching apparatus with a cassette; discloses that the cassette is first set to the home position of the wafer transferring chamber and then set to the loading/unloading chamber with the vertical transfer tweezer and horizontal transfer tweezer; and describes that each wafer is automatically controlled so that it is taken out from the cassette and is also returned to the original position in the cassette after the end of the etching process. Note especially pages 5-9 of the English translation of Drafts.

It is emphasized that Drafts has a single cassette and has all transfer of wafers vertically; in contrast, Bramhall, et al. has plural cassettes and has horizontal transfer between the cassette and the racks. Particularly in view of these differences, it is respectfully submitted that one of ordinary skill in the art concerned with in Bramhall, et al., especially having multiple cassettes, would not have looked to the teachings of Drafts. In particular, it is respectfully submitted that there would have been no motivation for one of ordinary skill in the art in connection with the apparatus and method of Bramhall, et al., to have looked to the teachings of Drafts for modification of the apparatus of Bramhall, et al.

In any event, even assuming, arguendo, that the teachings of Bramhall, et al. and Drafts were properly combinable, it is respectfully submitted that such teachings would have neither disclosed nor would have suggested the present invention, including features thereof as discussed previously. Specifically, noting particularly that Bramhall, et al. transfers a full cassette of wafers to the rack within the lock chamber, it is respectfully submitted that the combined teachings of the references would have neither disclosed nor would have suggested control means such that a substrate (or substrate and dummy substrate) stored in any position of any of the cassettes can be transferred; and/or transfer of substrates (or substrates and dummy substrates) from the vacuum processing chamber to original locations in their cassettes.

The contention by the Examiner in Item 3 on page 2 of the Office Action mailed July 28, 2004, that Drafts teaches "a similar substrate processing system comprising transferring substrates from cassettes", is respectfully traversed. It is respectfully submitted that Drafts teaches a processing system using a single cassette; as can be appreciated, with a single cassette, there is no choice of returning the substrate to another cassette. Since there is only a single cassette, in Drafts, this document will provide no description as to procedures where there are plural cassettes, where it becomes possible to return a substrate to a cassette which is not the original cassette. It is respectfully submitted that contrary to the interpretation of the teachings of Drafts by the Examiner, this article does not disclose transferring substrates from "cassettes", disclosing only transfer from a single cassette, and would have neither disclosed nor would have suggested the aspects of the present invention wherein processed substrates are returned to

respective original positions within original cassettes (that is, more than one cassette).

It is respectfully submitted that the additional teachings of Mase, et al. would not have rectified the deficiencies of the teachings of Bramhall, et al. and Drafts, such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Mase, et al. discloses a method of determining an end of cleaning of a semiconductor manufacturing apparatus, cleaned by dry etching using plasma discharge, wherein an impedance between discharge electrodes or a temperature in the semiconductor substrate process chamber is monitored while a constant current or voltage is supplied from a high-frequency power source to the discharge electrodes during plasma discharge. An abrupt change in the impedance or temperature is detected, which is determined to be an end of cleaning. See column 2, lines 15-28. Note also, for example, column 3, lines 47-52.

Even assuming, arguendo, that the teachings of Mase, et al. were properly combinable with combined teachings of Bramhall, et al. and Drafts, it is respectfully submitted that the combined teachings of all of these applied references would have neither disclosed nor would have suggested features of the present invention in connection with transfer of substrates, as discussed previously; and, moreover, would have neither taught nor would have suggested the additional features of the present invention in connection with, for example, transfer of dummy substrates as referred to previously. Specifically, it is respectfully submitted that the teachings of Mase, et al., even in combination with the teachings of Bramhall, et al. and Drafts, would have neither taught nor would have suggested features of dummy substrate

transfer including transfer of a dummy substrate from any location in the cassettes (e.g., holding dummy cassettes) in the atmosphere to at least one of the vacuum processing chambers, and return of the dummy substrate from the vacuum processing chambers back to its original position within its original cassette, and advantages thereof as discussed previously, and/or the other features of the present invention with respect to transfer of dummy substrates and advantages thereof.

It is emphasized that Drafts discloses transfer of substrates being processed, in a single cassette system, back to the original position in the cassette holding the wafers to be processed and/or processed. Such disclosure in Drafts, even in light of the teachings of Bramhall, et al., and Mase, et al., would have neither taught nor would have suggested return of dummy substrates as in various of the present claims.

The contention by the Examiner in Item 4 on page 3 of the Office Action mailed July 28, 2004, that Mase, et al. teaches "that dummy substrates are typically able to be transferred in the same way as regular substrates", is noted. The Examiner is respectfully challenged to point out the specific portion of Mase, et al., disclosing that dummy substrates are "typically able" to be transferred in the same ways as regular substrates.

In any event, it is respectfully submitted that even were Mase, et al. to disclose that dummy substrates are "typically able" to be transferred in the same way as a regular substrate, this would not provide a basis for a conclusion of obviousness. That is, it is respectfully submitted that in order to support a conclusion of obviousness, the Examiner must show a suggestion within the teachings of the applied prior art, to one of ordinary skill in the art, to combine the

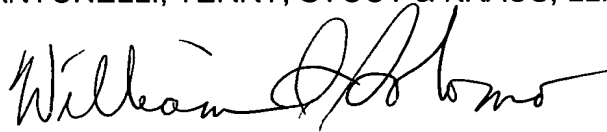
teachings of the references. The mere allegation that “dummy substrates are typically able to be transferred in the same ways as regular substrates” does not provide the necessary motivation. See Manual of Patent Examining Procedure, §2143.01. See Ex parte Levengood, 28 USPQ2d 1300 (PTO Bd. of Pat. Appeals & Int’f. 1993).

In view of the foregoing comments and amendments, reconsideration and allowance of all claims presently pending in the above-identified application, are respectfully requested.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account No. 01-2135 (Case No. 520.30414C55), and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "William I. Solomon", written in a cursive style.

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